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ABSTRACT

A project was conducted (1) to develop 27 instructional modules as part of a curriculum series that presents energy conservation concepts and skills and (2) to disseminate the modules for use in secondary and postsecondary vocational training programs and courses. The series of modules, entitled "Energy Awareness and Conservation: YOU Make the Difference," was developed in a six-step process: (1) reviewing available energy conservation instructional materials; (2) identifying and applying criteria to select occupational areas for module development; (3) identifying occupational and conservation competencies and skills as related to worker motivation to practice conservation; (4) developing two introductory modules and three activity-oriented instructional units to increase students' awareness of the problem and promote active student involvement in a variety of conservation projects; (5) designing a module format for the 22 occupation-specific modules that made optimal use of illustrations; and (6) writing, reviewing, and revising the 22 occupation-specific modules to teach on-the-job energy-conserving skills and behaviors. Six regional dissemination workshops were conducted to familiarize potential users with the materials and to discuss how they can be used. In addition, a flier, two interim project update newsletters, and a promotional brochure describing the project and the modules were sent to persons and organizations on the project mailing list. Project staff also delivered papers at vocational education meetings and wrote journal articles. (KC)

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ENERGY CONSERVATION VOCATIONAL INSTRUCTIONAL MATERIALS

Final Technical Report

(Contract No. 300-80-0956)

Rachel L. Rassen

Dorothy F. Reynolds

Prepared for

Office of Vocational and Adult Education

U.S. Department of Education

May 1982

U.S. DEPARTMENT OF EDUCATION
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Robert Scott of the Office of Vocational and Adult Education (OVAE) served as the initial U.S. Department of Education (ED) Project Officer. He deserves credit for drawing up the original work statement and for working closely with the project staff during the early stages of the project. Walter Brooking of OVAE served as the ED Project Officer during the remaining year of the project. He is responsible for many refinements that added so much to the final results.

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The directors of the regional networks of the National Network for Curriclum Coordination in Vocational-Technical Education (NNCCVTE) were exceptionally cooperative in helping project staff to set up and conduct the dissemination

workshops. The support provided by the regional directors contributed to making the workshops effective vehicles for introducing the materials to potential users, and for enhanced communication among and between vocational educators from across the country.

Rachel L. Rassen

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Project Director

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Chapter I

PREPARATION OF THE MATERIALS

To fulfill its Congressional mandate to make vocational education more responsive to the world of work, the U.S. Department of Education's Office of Vocational and Adult Education contracted with the American Institutes for Research (AIR) to develop and disseminate a series of work-related energy conservation instructional materials. This effort was viewed by the Department of Education as a project of national significance in view of: (1) the growing public awareness of the consequences of wasteful energy use and over-dependence upon foreign energy sources; (2) the dramatic increases in the cost of energy during the past decade; (3) the energy savings that can be achieved by using no- and low-cost conservation practices and techniques that are currently available; and (4) the need for on-the-job and occupation-specific conservation training materials at the secondary and post-secondary levels.

The series, entitled "Energy Awareness and Conservation: YOU Make the Difference," was designed for use with secondary and postsecondary vocational education students. The intent of the project was to augment existing instructional materials so that vocational students would receive training in the efficient use and conservation of energy as related to their places of future employment.

The major objectives of the project were to:

- develop 27 instructional modules which present energy conservation concepts and skills (two introductory modules, 22 occupation-specific modules, one Learning Activity Package, and two Energy and Conservation Activity booklets for secondary and postsecondary students, respectively);
- disseminate the modules to vocational educators and encourage their use in secondary and postsecondary vocational training programs and courses.

The process by which the instructional materials were developed involved six steps: (1) reviewing available energy conservation instructional materials as a basis for writing the State-of-the-Art report; (2) identifying and applying criteria to select occupational areas for module development; (3) identifying

occupational and conservation competencies and skills as related to worker motivation to practice conservation; (4) developing two introductory modules and three activity-oriented instructional units to increase students' awareness of the problem and promote active student involvement in a variety of conservation projects; (5) designing a module format for the 22 occupation-specific modules that made optimal use of graphic illustrations; and (6) writing the 22 occupation-specific modules to teach on-the-job energy conserving skills and behaviors.

The State-of-the-Art Report

Description

In developing the energy conservation instructional series, AIR project staff began by identifying, collecting, reviewing, and evaluating existing energy-related materials. Many topics were researched, including energy conservation, energy education, energy management, and energy production. Occupation-specific materials were also identified that provided information on conservation skills and techniques relative to those particular occupations.

The purpose of this review was threefold: (1) to locate currently available energy use and conservation materials; (2) to identify how well these materials addressed conservation issues and on-the-job conservation behaviors; and (3) to identify the vocational areas in which energy conservation materials were lacking, insufficient, or inappropriate. The following criteria were applied in the review of the materials:

- They described conservation behaviors that could be implemented by workers in existing occupations.
- They were in a format that could be used or adapted for instructional purposes.
- They were short, worker-oriented conservation materials designed for use by students who do not have access to outside reading materials.
- They were relevant to the experiences, vocational training, and instruction received by vocational students.
- They were dated no later than 1975.

Excluded from this review were energy awareness materials dedicated to the presentation of historical, sociological, environmental, or scientific perspectives on the current energy situation. Similarly, materials devoted to the development and use of such alternative energy sources as synthetic fuels, gasohol, nuclear, solar, and geothermal power were omitted. Over 400 materials were previewed in preparation of the State-of-the-Art Report, but only 90 materials met the initial review criteria.

Findings

In reviewing the identified materials, project staff found that the 90 materials identified were relevant to only 33 of the approximately 119 traditional vocational program course offerings. Of these 90 materials, 73 were informational publications designed for use in the workplace and only 17 were designed for classroom use. Over two-thirds of the informational, workplace-oriented materials stressed manager and owner behaviors rather than worker behaviors. Of the 17 classroom materials located, only 4 were stand-alone materials designed for use by students without supplementary outside reading materials. The other 11 classroom materials presented some information via teacher guides, student workbooks, and outside reading assignments. Finally, about three-quarters of the materials we reviewed exceeded 50 pages in length, thus seriously jeopardizing the ease with which they could be incorporated into existing vocational curricula.

Project staff concluded that none of the materials that were reviewed could be classified as short, worker-oriented conservation materials that could be used by students without relying on outside reading materials. The materials that were reviewed did, however, prove to be a rich resource of technical information from which staff writers could draw in developing the Energy Awareness and Conservation instructional materials.

The AIR materials were designed to overcome the shortcomings of the instructional materials that were reviewed in preparation of the State-of-the-Art report. More specifically, the Energy Awareness and Conservation materials were designed to be short instructional units intended for student use, that did not rely on outside readings, and that could be used to integrate on-the-job worker conservation behaviors into traditional vocational curricula.

Summary

The State-of-the-Art report, entitled Energy Conservation Strategies for Tomorrow's Workers: A Review of Instructional Material, was completed in

January 1981. The document was submitted to the ERIC clearinghouse for inclusion in their system. Formal notification of acceptance of the report was received in March 1981.

Occupation Selection Procedures

Selection Criteria

Because of the importance of directing the modules to occupations that can benefit most from information on energy use and conservation, project staff devoted considerable effort to the initial identification of the target occupations. The first step was to establish a set of criteria for selecting occupations by developing a matrix in which occupations representing all seven vocational education program areas[1] were rated on the following variables:

- 1978 secondary and postsecondary vocational education course enrollments--number and percent of total enrollments in each specified vocational education discipline.
- Occupational outlook--predicted employment growth rate through 1985. These ratings also served as an estimate of future vocational education enrollment.
- Estimated direct individual worker conservation potential for on-the-job energy savings.
- Estimated indirect or "secondary" effects the individual could have on energy conservation--potential for energy-related job opportunities and opportunities to influence or educate others about effective energy practices and skills.
- Energy use in the occupation relative to total U.S. energy consumption, estimated according to the energy usage of the economic sector or industry in which most employment occurs for this occupation.

An occupation selection matrix was developed in which occupations were rated on the criterion variables. A sample page of the matrix is shown as Figure 1.

The original list of occupations rated on these variables was at first restricted only by the qualification that the occupations be those for which vocational instruction programs commonly exist. Thus, new and emerging occupations,

[1] The seven areas are: Agriculture, Home Economics, Distributive Education, Business & Office, Trades & Industrial, Technical, and Health occupations.

(1)	(2)	(3)				(4)	(5)	(6)	(7)	(8)
Potential Target Occupations	ED Instructional Code and Course Title	1978 Student Enrollments: Secondary N	Secondary %	Postsecondary N	Postsecondary %	Occupational Outlook	Estimated Worker Conservation Potential	Secondary Effects on Energy Conservation	Estimated Energy Use Relative to Total U.S. Consumption	Comments
Auto Mechanic/ Diesel Mechanic	17.0302 Auto. Mech. 17.17 Diesel Mech.	210,300 7,448	14% 0.5%	34,970 6,382	8% 2%	As fast as avg.	High	Yes (4)(5)	High	Industrial production occupations represent 19% of total U.S. employment.
Plant Manager	17.17 Foremanship, Supv., & Mgt. Dev.	1,521	0.1%	17,328	4%	Average	High	Yes (4)	High	
Air Conditioning & Heating Mechanic & Installer	17.01 Air Cond. 17.2305 Sheet Metal	22,065 20,017	2% 1%	14,698 1,713	4% 0.4%	Much faster than avg.	Med-High	Yes (2)(3)	Med-High	Mechanics and repair occupations represent 4% of total U.S. employment.
Carpenter	17.1001 Carpentry	97,359	7%	14,129	3%	As fast as avg.	Med-High	Yes (1)(2)(3)	Med-High	
Welder	17.2306 Welding & Cut.	56,759	4%	30,302	7%	Faster than avg.	Med-High	Yes (1)(2)(3)	High	Approximately 4 mill[illegible] people (or about 5% of work force) are employed in construction.
Boiler Operator/ Stationary Engineer	17.1099 Other Const./ Mnt.	73,278	5%	12,259	3%	Much faster than avg.	High	Yes (1)(3)	High	
Insulation Installer	17.1099 Other Const./ Mnt.	73,278	5%	12,259	3%	As fast as avg.	Med-High	Yes (3)	Med-High	
Machinist	17.2302 Machine Shop	56,646	4%	10,428	3%	As fast as avg.	Med	Yes (1)(2)(3)	High	
Printer	17.19 Graphic Arts	77,798	5%	11,485	2%	Declining	High	Yes (4)	Med High	
Drafter	17.13 Drafting Occ.	97,151	7%	24,448	6%	Faster than avg.	Low	Yes (1)(2)(3)	High	

Figure 1: Sample page of Occupation Selection Matrix

such as "solar installer" and "energy auditor," for which there are few if any standard vocational training programs, were not considered. It was decided that the competencies represented by such occupations would be subsumed under other more traditional occupations.

The first draft of the occupation selection matrix included occupations with good potential for energy conservation mentioned in journal articles, literature on career selection, summaries of occupational competencies, newsletters on energy conservation, and the like. Suggestions for target occupations were also received from experts in vocational education and energy conservation.

Selection Process

In completing the occupation selection matrix, staff found that data on vocational course enrollments and estimates of employment outlook were easily located. However, reliable, consistent data on energy use by specific occupation were not generally available. Therefore, to supply ratings of individual worker energy-saving potential, project staff used a common sense approach to examine each occupation in terms of its energy-use activities. Ratings for the worker's "secondary effects" on energy conservation were based on whether or not the following attributes were characteristic of the occupation:

- Job opportunities exist in the energy production industries--nuclear power plants, petroleum and gas exploration and refining, coal mining, electric power, etc. (Note, however, that less than 2% of total U.S. workforce is employed by the energy-producing industries.)
- Job opportunities exist in production of energy through "alternate" sources, such as active solar, gasohol, and wind.
- Opportunities exist for workers to apply their existing skills in energy-conserving construction, applying new techniques such as passive solar heating and development of new methods for HVAC, both in new construction and refitting of plants and homes.
- Opportunities exist for workers in this occupation to promote energy conservation by educating or training other workers and consumers in the use of energy-efficient methods or products.
- Opportunities for workers in this occupation to design energy-saving transportation methods, vehicles, etc.

Finally, rankings for occupational energy use relative to total U.S. energy consumption were based on data for the energy consumption of the economic

sector in which most employment in the occupation occurs. For example, an occupation related to the agricultural sector (such as greenhouse worker) received a "low" rating because the overall agricultural sector represents less than 3 percent of total U.S. energy consumption.

Final Selection of Occupations

The first response by project staff to the matrix yielded a list of 43 occupations. This list, along with the matrix rankings and accompanying notes and references, was submitted to the Project Officer, technical consultants, and the project Panel of Experts. (See Appendix A for a list of these consultants and experts.) These individuals reviewed the matrix and ranked the occupations in order of priority; staff then compiled the feedback from the reviewers and targeted 22 of the 43 occupations for module development.

At the nearly unanimous recommendation of the reviewers, "homemaker" was added as a twenty-third occupation, although it had not been included on the original matrix. Reviewers felt that while homemaking is not strictly speaking an occupation for which one is paid, it is of vital importance to energy conservation and is also an area with direct relevance to nearly everyone.

The final list of target occupations was submitted to the Project Officer and approved with one minor adjustment--"mechanical engineering technician" and "industrial engineering technicians" were combined into one module, for a total of 22 occupation-specific modules.

Determination of Module Content

Once the target occupations were identified, work began on determining the content of the occupation-specific modules as well as of the introductory and activity modules. To address the dual purpose of the instructional series--energy awareness and energy conservation--staff identified techniques for motivating students and workers to conserve energy as well as competencies related to conservation.

Motivational Techniques

Project staff conducted a literature review on the subject of worker motivation, especially as it relates to energy conservation behaviors. A

background paper entitled "Motivating Tomorrow's Workers: A Review of Motivation Theories, Practices, and Issues in Energy Conservation" was prepared and submitted to the Panel of Experts and the Project Officer for review and comment. The first part of the paper described salient techniques that have been found to be effective in eliciting conservation behavior at home and on the job. The second part of the paper presented key issues to be addressed in the modules in this instructional series.

The Energy Awareness and Conservation modules were developed with an emphasis on two of the motivational practices identified in the paper: credible communication of the energy situation and instruction or training on how to take action to solve energy problems. Other motivational techniques, such as financial and social incentives, the use of role models and prompts, goal-setting, monitoring, and feedback, were brought to bear in specific modules as appropriate.

Based on findings in the motivation background paper, staff decided to develop two introductory "motivation" modules. The first module introduced students to energy conservation issues by providing clear, consistent, and reliable information on basic energy concepts, the current national and international energy supply and demand situation, and alternative pros and cons of energy sources. The second motivation module presented energy conservation techniques applicable to home and work and emphasized the point that each individual can make a difference in the large energy picture. As previously noted, outlines of the two introductory modules and the instructional objectives for each were included in the background paper.

Conservation Competencies

The reviews of energy-conservation materials conducted for the State-of-the-Art Report and for the motivation paper yielded a rich supply of information on energy-saving actions appropriate to a broad spectrum of work settings. Project staff identified a consistent set of approaches to energy conservation that could be applied to jobs in the agricultural, industrial, and commercial sectors, and in homes as well as in offices and factories. Project staff categorized these actions into six areas of "conservation competencies" as follows:

- Maintenance or "housekeeping" activities
  Example: repairing broken windows; installing insulation
- Modifying production operations or developing new work methods
  Example: operating equipment at top efficiency

- Reducing waste or scrap
  Example: avoiding throw-away products

- Recycling used materials
  Example: re-using or selling scrap materials

- Changing transportation practices
  Example: using alternate, more fuel-efficient modes of transportation

- Sharing ideas for energy efficiency with co-workers, supervisors, and customers
  Example: suggesting purchase of solar heating systems.

Staff writers used these six areas of competency as the basic outline for each occupation-specific module.

Occupation-specific Competencies

The staff writers identified occupational competencies related to energy conservation by matching the "conservation competencies" listed above with information on occupational competencies derived from a review of written materials, observations of workers on the job, interviews with workers in the target occupations, and discussions with vocational education instructors. Emphasis in the modules on the various "conservation competencies" thus varied from module to module, depending on the specific competencies and energy saving possibilities for the particular occupation. For example, many of the modules in the Distributive Education area (Foodstore Employees and Retail Store Managers, for example) have a strong emphasis on the sharing competency, since workers in this area have great opportunities for customer contact and thus for customer education. The Home Economics area modules have an emphasis on the maintenance competencies. Modules written for occupations in the Trades and Industrial area tend to emphasize modifying production operations, reducing waste and scrap, and recycling.

As a double check on the accuracy and relevance of the occupation-specific competencies, draft modules were reviewed by a second group of on-the-line workers and vocational educators. The module writing/review process is described in more detail in Chapter 2 of this report.

Instructional Activity Units

The instructional design plan called for the development of three student-oriented instructional activity units. These included the Learning Activity Package (LAP), and two units on Energy Use and Conservation Activities for Secondary and Postsecondary students, respectively. Whereas the LAP was intended for use with individual or groups of students in classroom settings, the two Energy Use and Conservation Activities were designed primarily for use by student groups outside the classroom context.

Learning Activity Package

The LAP was designed as a preliminary exercise to help students perform a simple energy survey of their classroom and school. By conducting this survey, students learned the basic steps of analyzing efficient energy use that could also be applied to the analysis of energy use in businesses and homes.

The LAP was designed to encourage the involvement of teaching staff and students, to help them feel a part of the team conservation effort. The LAP is intended for use under teacher supervision with either individuals or small groups of students. However, it is recommended that the teacher or students obtain permission from the principal or administration to survey the school prior to implementing the LAP.

Energy Use and Conservation Activities

The Activity modules were developed for use as a component of a vocational student organization's program of work and as an integral part of the student's curriculum. The two activity units, one for secondary and one for postsecondary students, identify and describe a number of energy conservation projects that can be implemented by student groups outside the classroom. Both units include suggestions for discipline-related activities with regard to the seven vocational education service areas. The distinction between activities at the secondary and postsecondary levels recognizes that in certain vocational areas, such as the technical service area, the main body of training occurs at the postsecondary level of education. What may be appropriate for a postsecondary student in this area may be too advanced for the secondary level student.

The Activity Units were reviewed by professionals in vocational education and in energy conservation as well as representatives from vocational education student groups and the Director of Project NEED (National Energy Education Day), sponsored by the Department of Energy. Suggestions from these sources, as well as the various project consultants, were invaluable in generating the various conservation projects included in each activity unit.

Formatting Considerations

Attention was focused on designing a format for the modules that would: (1) provide a common structure and content outline for all the occupation-specific modules; (2) facilitate stylistic consistency among writers; and (3) address the previously identified conservation competencies as appropriate for each occupation.

Illustrations

In view of the page limitation on module length and the emphasis on the inclusion of graphics and use of appropriate media, as specified in the contract, the decision was made to use the cover illustration as a primary vehicle for instruction. The project's graphic artist was assigned the task of illustrating, by means of cartoons, examples of energy misuse and mismanagement--behaviors that commonly occur in the performance of the requirements of the occupations. Each occupation-specific module contains as an Introductory Activity the task of identifying the examples of energy waste illustrated on the cover and then listing energy-saving solutions. The cartooned cover illustrations were designed to be humorous, attractive, and attention-getting. To accomplish this task, the artist worked closely with the project authors to identify situations that were related to the identified occupational competencies and the conservation competencies. Care was taken to make the illustrations sex-fair and racially unbiased.

Objectives-based

Each module was organized around a set of competency-based objectives. The objectives were identified in a thorough search of the energy conservation literature. They are presented in the introductory sections of the 22 occupation-specific modules. A follow-up quiz in each module invites students to test their mastery of the objectives.

Question-Answer Format

The modules address the question: "What can one individual do on a specific job--for example, as a carpenter, as a nurse, as a food service worker--to save energy?" Using a problem-solution format, each module points out common sources of energy waste in each of the target occupations and then gives down-to-earth solutions that can be implemented by individual workers as they carry out their customary work responsibilities.

Adaptable

The modules were designed so that they could be easily infused into the regular curriculum of a vocational education course. While two of the modules, Energy Efficiency: The Big Picture and Energy Efficiency for Businesses and Homes, as well as the Learning Activity Package were planned as introductory materials, they, along with the other modules, may be used in any sequence that is convenient to the instructor. The modules may be used separately or in combination with one another, and for individualized or group instruction. Each module is cross-referenced with related modules in the series, and each contains references to other materials and resources related to energy conservation.

Action-oriented

Three booklets in the series present group activities that promote energy awareness and motivate energy conservation. These are: the Learning Activity Package: Conducting An Energy Survey and two resource booklets on Energy Use and Conservation Activities, which were described in an earlier section of this chapter. In addition, activities appropriate for individual students or entire classes are suggested throughout each of the other modules. These activities offer students the opportunity to demonstrate and practice energy conservation at home and in their communities.

Summary

Two introductory modules, three Activity Units, and twenty-two occupation-specific modules were developed to teach on-the-job energy conservation skills and techniques to vocational education students-in-training. The modules do not rely on outside readings, so that on-the-job worker conservation training can be easily integrated into traditional vocational curricula. The instructional

approach emphasizes two motivational practices identified in the review of worker motivation literature as being effective in eliciting conservation behavior: credible communication of the energy situation and instruction in how to take action to solve energy problems. The instructional design format includes: identified occupation and conservation competencies; a question-answer/problem-solution presentation of specific conservation activities; illustrations as a primary vehicle for instruction; and activities, both within each module and in three separate units, to encourage active involvement in the practice of energy conservation at home and on-the-job.

Chapter II

WRITING AND EDITING THE MODULES

Figure 2 presents a simplified model of the project's module production process. The writing and editing process is described below in more detail. Appendix B contains a complete list of module titles as well as other materials produced during the course of the project.

Research Activities

The project director assigned each of the seven staff writers responsibility for the modules in a particular vocational discipline, e.g., most or all of the agriculture modules or the technical modules. This arrangement facilitated concentrated research efforts, allowed the writers to acquire expertise in their assigned discipline, and led to coordination of the content of the various modules in that discipline, so that the information presented would not be redundant across modules.

Prior to writing the occupation-specific modules, staff writers first reviewed written documents related to energy use and conservation for the target occupation. As previously indicated in the description of the State-of-the-Art report, AIR had assembled a collection of documents on energy conservation, written by state and federal energy agencies, manufacturer associations, trade unions, power companies, and private individuals and corporations. For some occupations (homemakers, for example) there were numerous documents to review. In other occupations (machinists, for example), only one or two documents that even indirectly related to on-the-job energy conservation practices were available.

After preparing an outline based on the findings from the review of available documents, each writer contacted a worker in the target occupation and arranged for an interview. In most cases, writers conducted the interviews at the individual's workplace--in a greenhouse, day care center, factory, etc.--where there was ample opportunity to observe examples of energy conservation or waste in the occupation's setting and to discuss these with the workers. The

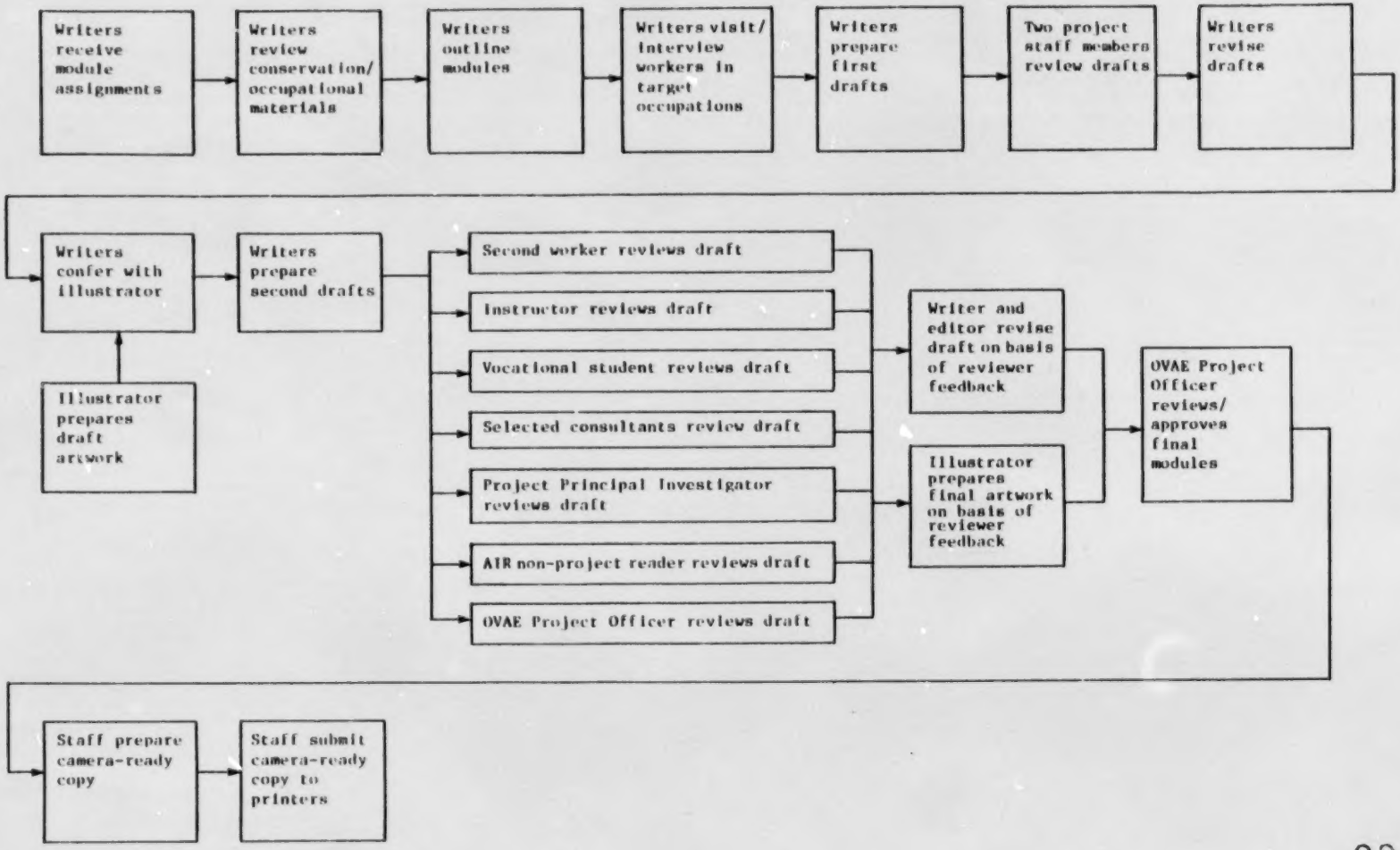
Writers receive module assignments
Writers review conservation/ occupational materials
Writers outline modules
Writers visit/ interview workers in target occupations
Writers prepare first drafts
Two project staff members review drafts
Writers revise drafts
Writers confer with illustrator
Writers prepare second drafts
Second worker reviews draft
Instructor reviews draft
Vocational student reviews draft
Selected consultants review draft
Project Principal Investigator reviews draft
AIR non-project reader reviews draft
OVAE Project Officer reviews draft
Illustrator prepares draft artwork
Writer and editor revise draft on basis of reviewer feedback
Illustrator prepares final artwork on basis of reviewer feedback
OVAE Project Officer reviews/ approves final modules
Staff prepare camera-ready copy
Staff submit camera-ready copy to printers

Figure 2. Module production process

staff artist accompanied the writers on some site visits and also made independent visits to assure the accuracy of his illustrations. Writers also interviewed vocational instructors and students. They then prepared first drafts of the modules.

Identification of Related Resources

One very valuable result of staff research and development efforts was the identification of resource materials related to energy education in the target occuations. As has been mentioned, AIR collected hundreds of conservation-related documents, all of which were categorized by occupational area and reviewed by project staff. The most pertinent materials were listed at the back of each module under the section on "Where to Find More Information on Energy Efficiency." These reference materials were on the whole written at a more technical and "adult" level than the modules themselves and tended to be directed to managers and owners rather than to students or workers. Thus, the referenced materials do not duplicate the content of the modules. But they are intended to serve the instructor or the student who wishes to pursue energy-related issues and techniques beyond the basic, practical suggestions presented in the modules. All references listed in the modules include the publishers' addresses or other information on availability so that they can be readily located or ordered by students.

In addition to references to printed materials, each module includes names and addresses of agencies and organizations that can provide information on energy efficiency and conservation. The reference sections of the Activities booklets also include names and addresses of organizations that are directly involved with student groups and energy activities--for example, the Student Exposition on Energy Resources and student vocational organizations, such as Future Business Leaders of America.

Module Review Procedures

First drafts of all modules were read by the assistant project director, who served as primary module editor, and by at least one other staff member.

They discussed their comments and suggestions with the writers, who then prepared revised drafts and worked with the staff artist on the preliminary cover illustrations. The revised, illustrated second drafts were then subjected to a multi-faceted review process, as follows:

- Writers sent their modules to a second "on-the-line worker"--someone other than the person originally interviewed. When the interviewed worker so requested, he or she was also given the opportunity to review the draft module.

- The project director arranged to have each module reviewed by an instructor in the targeted occupation, either at the high school or the community college level.

- The project director mailed module drafts to external reviewers from among the members of the panel of experts and the technical consultants. These reviewers included technical experts in energy management as well as specialists in curriculum design and sex equity and in the various vocational disciplines.

- Project staff met with a group of recent high school graduates of vocational programs who were currently receiving on-the-job training in the target occupations. The students had the opportunity to read the modules and then discussed their written comments with project staff. Module drafts were also mailed to vocational student reviewers who had been recommended by various external reviewers.

- AIR in-house reviewers for the second drafts included the project's principal investigator and an AIR principal research scientist not associated with the project.

- Finally, drafts of all modules were reviewed by the OVAE Project Officer and the OVAE program area specialist in the designated vocational discipline.

In summary, each module was reviewed by from six to ten individuals representing various areas of expertise. A standard materials review form was used.

Feedback from the reviewers was directed to the module authors, who then discussed each module with either the project director or assistant director to incorporate suggestions, as feasible. At this stage, the staff artist also received feedback from reviewers and began to prepare the final module covers and other artwork.

Summary

The 27 modules in the series were developed over a period of several months using a multi-stage process of researching, writing, reviewing, and revising. The research included examination of written materials, discussion with consultants and experts in energy use, and, most importantly, site visits and interviews with workers in the target occupations. Each module was reviewed by workers, instructors, students, and a variety of specialists. Finally, the modules were revised and graphics and cover illustrations were finalized. Two hundred and fifty initial sets of modules were printed in January, 1982, for dissemination to individuals and organizations, as specified in the contract. The publisher completed printing the modules in May, 1982, at which time the Energy Awareness and Conservation materials were submitted for inclusion in the ERIC Clearinghouse system.

Chapter III

DISSEMINATION

The major activities for disseminating the Energy Awareness and Conservation series to vocational educators consisted of six regional dissemination workshops for primarily state-level educators. In addition, an informational flier, two interim Project Update newsletters, and a promotional brochure describing the project and the modules were sent to individuals and organizations on the project's mailing list. Project staff also delivered papers at vocational education meetings and conventions and wrote several journal articles. Lastly, a publisher was identified for continued distribution of the Energy Awareness and Conservation modules after completion of the project.

Informational Flier

An informational flier describing the project, with a tear-off request-for-information, was developed during the initial phase of the project. A preliminary mailing list was prepared that included vocational instructors and organizations listed on the mailing list of the Vocational Education Curriculum Specialist project (VECS)--another AIR project funded by OVAE--as well as energy and conservation interested individuals and organizations identified at the advent of the project. Over 1,400 informational fliers were distributed. Based on the requests-for-further-information responses, a separate Energy Awareness and Conservation mailing list was created.

Project Update Newsletter

Two Project Update newsletters, describing ongoing project activities and products, were distributed to over 2,000 individuals and organizations on the combined VECS and Energy project mailing list in February and in October, 1981. These newsletters served to maintain contact with those respondents to the informational flier who had expressed interest in the project. The first issue included: an abstract of the findings of the State-of-the-Art report; a brief

summary of the Worker Motivation paper, and a description of the two introductory modules. The second issue listed the names of the occupation-specific modules and briefly outlined their content. Project outreach and dissemination activities were also described.

Dissemination Workshops

Six Energy Awareness and Conservation dissemination workshops were held in January, February, and March 1982. The purposes of these workshops were fourfold: (1) to orient the participants to the potential uses of the conservation instructional materials; (2) to allow the participants a full opportunity to examine the materials; (3) to obtain participants' reactions to the materials; and (4) to encourage participants to prepare a plan for disseminating the materials in their respective states.

Ninety-eight vocational and energy educators from 50 states and territories attended the workshops, which were held in the following locations: Los Angeles, California; Atlanta, Georgia; Arkadelphia, Arkansas; Salt Lake City, Utah; Columbus, Ohio; and West Greenwich, Rhode Island. Directors of the National Network for Curriculum Coordination in Vocational-Technical Education (NNCCVTE) assisted the project staff in organizing the workshops. Three of the dissemination workshops were held in conjunction with regional NNCCVTE meetings.[1] The costs of conducting these workshops were shared between the project and the NNCCVTE. However, the real benefit of these arrangements rested in the opportunities to address vocational educators and administrators who are actively involved in curriculum dissemination, and who otherwise may not have been able to attend the workshop.

Presentation of the Materials

The project director introduced the Energy Awareness and Conservation materials to workshop participants and made a presentation describing the rationale behind the development of these instructional materials. Topics addressed in the presentation included:

- the findings of the State-of-the-Art report regarding currently available energy conservation instructional materials for use with vocational education students;

[1]The three dissemination workshops conducted in conjunction with the NNCCVTE were held in Arkadelphia, Arkansas; Columbus, Ohio; and West Greenwich, Rhode Island.

- the conclusions from the review of the literature on effective worker motivation practices and techniques;
- a description of the process through which the target occupations were identified and selected;
- a discussion of the considerations and guidelines applied in the development of the modules;
- a brief description of the Energy Awareness and Conservation curriculum series as related to the previously mentioned topics and considerations.

Following this presentation, workshop participants were given an opportunity to examine and discuss the materials in small groups of four to five members. Each workshop participant was given a complete module set. The members of each group designated one person to write down both strengths and concerns about the materials that emerged from the group study and discussion process. To encourage open discussion among members, AIR staff did not participate in these small group sessions.

At the conclusion of these small group sessions, workshop participants met once again in a large group. The project director solicited summaries of the strengths and perceived inadequacies of the materials that had emerged in the small group sessions, and then proceeded to respond to the expressed concerns. Dialogue that ensued among AIR staff and workshop attendees helped to clarify the responses. In general, the input from the participants was incisive and thought-provoking.

Workshop participants were also given time to develop plans for disseminating the Energy Awareness and Conservation materials in their respective states. The plans were submitted to the AIR project director by each of the teams of state representatives. A variety of creative strategies were included in the plans. Although many of the workshop participants do not have direct responsibility for the purchase and dissemination of instructional materials, the development of these dissemination plans served to encourage the attendees to consider alternative strategies for disseminating and promoting the use of these materials--for example, through various vocational-industrial relationships with trade unions, public utility companies, and State Energy Offices as well as traditional vocational teacher organizations.

Within several weeks of the conclusion of the six dissemination workshops, each workshop participant received a complete set of dissemination plans from all the workshops. The purpose of distributing these dissemination plans was to further encourage communication between states and among regions, and to share creative dissemination strategies that otherwise might not have occurred to individual state representatives.

Reactions of the Participants

The modules were very well received by the participants attending the workshops and were viewed as having a much broader audience than only vocational students. Participants emphasized that the modules provided a broad awareness of the problems of energy waste and the benefits of energy conserving behaviors and practices. The modules were perceived as being useful in prevocational exploratory classes, co-op classes, energy education, science, and social science classes in both secondary and postsecondary settings. Appendix C contains a summary of workshop evaluation forms completed by the participants.

Convention Papers and Journal Articles

During the course of the project, the project director and the principal investigator delivered papers on the subjects of energy conservation and instructional materials development at meetings of the American Vocational Association (AVA), American Personnel and Guidance Association (APGA), and the California Association for Vocational Educators (CAVE). Informal presentations of project materials were also made by the project director to meetings of the California Energy Education Forum, the National Network for Curriculum Coordination in Vocational-Technical Education (NNCCVTE), and the annual meeting of the National Research Coordination Units (NRCU). In addition, the project director and the assistant project director published project-related articles in the March and April 1982 issues of VocEd magazine. A complete list of convention papers and articles appears in Appendix D.

Promotional Brochure

Project staff developed a promotional brochure to advertise the completion of the project and the availability of the Energy Awareness and Conservation

modules. The development of the brochure was delayed until negotiations with the publishing company were completed so that cost information and ordering procedures could be included in it. A 16-page brochure was developed by project staff in cooperation with the publisher's graphics department.

The promotional brochure was sent to over 1,400 individuals and organizations on the project mailing list who expressed interest in the Energy Awareness and Conservation instructional series. In addition, the publisher plans to reprint 20,000 to 30,000 copies of the promotional brochure to distribute to vocational educators and organizations on the publisher's mailing list.

Publishing Arrangements

An agreement was reached with the American Association for Vocational Instruction Materials (AAVIM) to print and distribute the Energy Awareness and Conservation modules on a cost-recovery basis. Individual modules, as well as the entire 27-module set, can be ordered. Each module will be priced according to the number of pages contained therein at a cost of 4¢ per page. A 10 percent discount is offered if a complete set is ordered. The discounted cost of a complete set is approximately $36. Materials can be ordered directly from:

The American Association for Vocational Instructional Materials
Engineering Center
Athens, Georgia 30602

Summary

Dissemination activities have been ongoing throughout the duration of the project including: (1) the distribution of an informational flier; (2) development of two Project Update newsletters; (3) presentations at national conventions; (4) publication of project-related articles; (5) development and distribution of an end-of-project promotional brochure; (6) completion of six regional dissemination workshops; and (7) an agreement with the American Association for Vocational-Instructional Materials to publish and distribute the modules. These dissemination efforts have been very successful in attracting the attention of a broad spectrum of individuals and organizations--in the vocational education community as well as among general education, energy education, and industry-related audiences--who are interested in obtaining and using the Energy Awareness and Conservation Instructional Materials.

Appendix A

List of Project Technical Consultants, Advisory and Review Panelists

The project's Advisory and Review panels, which assisted AIR project staff to identify existing resources and to critique module drafts, included the following people.

Dr. Ralph Bohn
Dean of Continuing Education
California State University
San Jose, California

Dr. Robert Bailey
Professor of Nuclear Engineering
Director, Program for Energy Research, Education, and Public Service
Ohio State University
Columbus, Ohio

Dr. Richard Bennett
Associate Professor
Department of Agriculture
University of California at Davis
Davis, California

Mr. Jack D'Angelo
Instructor, Vocational Education
Retail Trades
San Francisco School District
San Francisco, California

Ms. Rebecca Douglass
Director, East Central Network Curriculum Center
Sangamon State University
Springfield, Illinois

Dr. Marion Warner Holmes
Director of Vocational Education Instructional Programs
Division of Career Education
School District of Philadelphia
Philadelphia, Pennsylvania

Dr. William Knaak
Superintendent, Special Intermediate School District #916 for Vocational-Technical and Special Education
White Bear Lake, Minnesota

Mr. Robert E. Lillo
Consultant, Curriculum Development
Industrial and Health Education
California State Department of Education
Sacramento, California

Mr. John McCall
Instructor, Vocational Education
Oakland School District
Oakland, California

Dr. Arnold Nadler
Adjunct Associate Professor
Department of Social Affairs and Policy Analysis
The New School for Social Research
New York City, New York

Ms. Genita Pacely
Instructor, Vocational Education
Office Occupations
Oakland School District
Oakland, California

Mr. Jim Richmond
Instructor, Vocational Education
Creswell Junior High School
Creswell, Oregon

Dr. Jane Roberts
Professor, Department of Home Economics
Western University
Bellingham, Washington

Dr. Frank Santoro
Deputy Assistant Commissioner
State Department of Education
Bureau of Vocational-Technical Education
Providence, Rhode Island

Mr. David Sutton
Manager of Educational Services
Western Solar Utilization Network
Portland, Oregon

Dr. Hollie B. Thomas
Associate Professor of Vocational and Technical Education
Florida State University
Tallahassee, Florida

Mr. Paul C. Valentine
Attorney
Blase, Valentine, and Klein
Palo Alto, California

Appendix B

List of Materials Produced Under Contract #300-80-0956

Title	Author
Energy Conservation Strategies fo Tomorrow's Workers: A Review of Instructional Materials (State-of-the-Art report)	BP Pletcher JE Flagle
Motivating Tomorrow's Workers: A Review of Motivation, Theories, Practices, and Issues in Energy Conservation	DF Reynolds RL Rassen C McFarlane
Energy Efficiency: The Big Picture	DF Reynolds
Energy Efficiency for Businesses and Homes	C McFarlane
Energy Efficiency for Tomorrow's Nurses	BP Pletcher
Greenhouse Workers	SL McBain
Field Crop Farmers	SL McBain
Food Service Workers	SL McBain
Child-Care Workers	EA Campbell
Homemakers	JE Flagle
Secretaries and Word Processing Operators	SL McBain
Office Managers	SL McBain
Hotel, Motel, and Residental Property Managers	JE Flagle
Retail Store Managers	JE Flagle
Restaurant Employees	JE Flagle
Foodstore Employees	JE Flagle
Bus, Truck, and Taxi Operations Managers	JE Flagle
Electronics Technicians	DF Reynolds
Engineering and Industrial Technicians	DF Reynolds
Architectual Technicians	DF Reynolds
Boiler Operators and Stationary Engineers	JM Wolman
Auto Mechanics	JM Wolman
HVAC Specialists	JM Wolman
Machinists and Tool and Die Makers	DF Reynolds

Title	Author
Plant Supervisors	JM Wolman
Carpenters	JM Wolman
Learning Activity Package	JM Wolman
Energy-Use and Conservation Activities for Secondary Students	C McFarlane
Energy-Use and Conservation Activities for Postsecondary Students	C McFarlane
Final Technical Report; Energy Conservation Vocational Instructional Materials	RL Rassen DF Reynolds
Summary Report (10 pages)	RL Rassen JA Hamilton
Executive Abstract (1 page)	RL Rassen

Appendix C

Summary of Workshop Participant Evaluations

At the closing session of each of the dissemination workshops, participants were asked to complete a brief questionnaire evaluating the quality of the workshop. The questionnaire is shown as Figure A. The purpose of the evaluation was twofold: (1) to revise and improve the subsequent dissemination workshops on the basis of feedback from participants in the earlier workshops; and (2) to gather information on participants' reactions to the modules themselves.

Ninety-four (94) participants, or 97 percent of the participants, completed the evaluation form, which consisted of 11 questions. Their responses are summarized below.

Position of participant (Question 1). The position most frequently held by participant respondents (31%) was State Curriculum Supervisor/Developer/Specialist; 21 percent of participants were State Liaison Representatives for NNCCVTE; and 16 percent were state supervisors of a vocational discipline. The rest of the participants represented 23 different positions, ranging from state director of vocational education to high school vocational education instructor.

Professional connection with energy education (Question 2). As might be inferred from their professional positions, most participants' (54%) professional connection with energy education came through their responsibility for disseminating, coordinating, or developing curriculum in vocational education. They were in some way working on incorporating energy education into the vocational education curriculum. Another 13 percent of respondents were involved in providing inservice training and staff development activities related to energy education. Others were involved in such activities as coordinating the activities of the state vocational education and state energy offices and managing and administering education programs at various levels (high school, community college, etc.). It appears that the workshop attracted a group of professionals

who were in positions where AIR's energy curriculum materials were potentially of immediate utility.

Workshop and presenter ratings (Questions 3 and 4). The usefulness of the workshop as a whole and the preparation of the presenters were rated by 67 of the workshop participants.[1] These respondents gave the overall workshop a positive mean rating of 4.4 on a 5-point scale--that is, the average rating fell between "the workshop as a whole was highly informative and . . . useful" and " . . . had some merit; served its purpose." They also rated the presenters as being "well prepared," "responsive," "organized," and "knowledgeable," giving a mean response of 2.65 on a 3-point scale.

Workshop organization and suggestions for improvement (Questions 5, 6, 7). Comments on aspects of the workshop that should have been emphasized more, emphasized less, or improved were quite diverse. For example, six respondents wanted more emphasis on module development, and five respondents wanted less emphasis on this same topic; 14 respondents praised the session on the Oregon high school energy project, and 7 wanted less emphasis on this session. Despite these and other contradictory comments, AIR found participant comments generally helpful in planning each subsequent workshop. A number of participants[2] did not respond to Questions 5 through 7 or else commented that the workshop topics were well balanced as presented.

Many respondents volunteered comments on positive aspects of the workshops. They mentioned the exchange of ideas, sharing of state dissemination plans, and the opportunity to review this particular set of materials as being particularly beneficial.

Usefulness and quality of materials (Questions 8 and 9). Participants gave high overall ratings on the usefulness and quality of the Energy Awareness and Conservation modules. The mean response regarding the usefulness to the participants of the materials was 3.36 on a 4-point scale, the average response falling

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[1] Questions 3 and 4 were not included on the evaluation forms for the first two workshops.

[2] Percentages of respondents who either gave no response or commented that the balance was satisfactory were as follows:

What workshop topic should have been emphasized more?	40%
What workshop topic should have been emphasized less?	66%
What suggestions for improving the workshop . . . ?	43%

Figure A

ENERGY AWARENESS AND CONSERVATION DISSEMINATION WORKSHOP EVALUATION

1. Which is the most accurate description of your position?

_____ State Director of Vocational Education
_____ State Curriculum Supervisor/Developer/Specialist
_____ State Supervisor of a Vocational Discipline
_____ State Energy Office Staff Member
_____ NNCCVTE SLR
_____ NNCCVTE Regional Director
_____ Vocational Teacher Educator
_____ Local Director of Vocational Education
_____ Other _____

2. What is your professional connection with energy education? _____

_____

3. The workshop as a whole

_____ was highly informative and provided material that will be useful to me.
_____ had some merit; served its purpose.
_____ was fair.
_____ was mildly disappointing.
_____ provided no new ideas for me; didn't hold my interest.

Comments: _____

_____

_____

_____

4. The presenters

_____ were well prepared and responsive to the needs of the group.
_____ were well organized and appeared knowledgeable.
_____ seemed somewhat confused on certain points.

Comments: _____

_____

_____

_____

5. What workshop topic(s) should have been emphasized more? _____

_____

_____

6. What workshop topic(s) should have been emphasized less? _____

_____

_____

7. What suggestions for improving the workshop would you recommend to the presenters? _____

_____

_____

8. Overall, do you feel that the materials demonstrated in the workshop will be useful to you?

_____ Yes, very much _____ Yes, somewhat _____ Yes, a little _____ No

9. How do you rate the quality of the Energy Awareness and Conservation modules?

___ Excellent (very valuable) ___ Good (clear and relevant) ___ Fair (sufficient) ___ Poor (somewhat irrelevant or confusing)

10. How do you rate the dissemination linkages between state-level staff and local instructors in your state?

___ Excellent ___ Good ___ Good in some disciplines but not in others ___ Weak

11. If you were to order additional Energy Awareness and Conservation modules, would you prefer to order the entire set or portions of the series?

___ Entire set ___ Select modules from the series; in this case, which modules would you order? ___ Both ways

Module Titles: _____

_____

_____

Thank you for taking the time to complete this form.

between "very useful" and "somewhat useful." The mean rating on the quality of the modules fell between "excellent (very valuable)" and "good (clear and relevant)" (3.06 on a 4-point scale).

Dissemination and marketing of modules (Questions 10 and 11). Two items on the questionnaire were designed to help project staff plan for publication and dissemination of the modules. The first time asked how effective the dissemination linkages were between state and local vocational educators in the various states. If linkages were rated very highly, this would imply that publicizing the modules at the state education agency level would likely be an effective marketing strategy. The mean response to this item was 2.82 on a 4-point scale, somewhere between "good" and "good in some disciplines but not in others." No significance could be attached to this intermediate response.

The last item on the questionnaire asked if participants would be apt to order the entire set of modules or would prefer the option of purchasing selected modules in the series. Responses were as follows:

Entire set - 26%

Selected modules - 36%

Both entire sets and selected modules - 20%

No response - 18%

Based on this information, project staff decided to contract with a publisher who was willing to sell modules individually as well as in the complete 27-part package.

Appendix D

List of Convention Papers and Articles

Convention Papers	Convention/Date	Author(s)
Addressing the Nation's Energy Use Problem: A Challenge to Vocational Education	American Vocational Association December 1980	JA Hamilton RL Rassen C McFarlane
Energy Efficiency: A New Challenge to Vocational Counselors	American Personnel and Guidance Association, April 1981	RL Rassen
Conservation: The Overlooked Component of Energy Education	International Energy Education Conference, July 1981	RL Rassen
Designing an Energy Education Curriculum in Productive Conservation for Vocational Education Students	American Vocational Association December 1981	RL Rassen
Instructional Materials Should Address More Than Skills	American Vocational Association December 1981	RL Rassen
Energy Conservation Curriculum	California Association of Vocational Educators, April 1982	JA Hamilton

Articles	Publication/Date	
Selecting Energy Conservation Instructional Materials	VocEd magazine March 1982	RL Rassen
Locating Instructional Materials for Energy Education	VocEd magazine April 1982	DF Reynolds
Energy Awareness and Conservation: You Make the Difference	Memo, April 1982	RL Rassen

Articles describing the Energy Awareness and Conservation project also appeared in the following publications:

Publication	Date
Energy Currents (published by the American Association of Community and Junior Colleges)	November 1980
The Peninsula Times-Tribune newspaper	January 5, 1981
Manpower and Vocational Education Weekly	February 1981
Report on Educational Research	January 1981
February 1981 issue of the VECS Newsletter	February 1981
Information (published by DOE)	March 1981

Publication	Date
The Voice (published by the Pennsylvania National Education Association	May 1981
July 1981 issue of Energy Currents	July 1981
Florida Vocational Journal	August 1981
Maryland Energy Notebook	September 1981
The Energy Awareness Guide: A Resource Book for Vocational Instructors (under development by the American Vocational Association)	
Memo (published by the National Center for Research in Vocational Education)	October 1981
The Energy Curriculum Training Resource Notebook (published by the University of Indiana)	December 1981
The Animated Bibliography: A Sample of Energy Education Curriculum Materials (published by the Energy Action in Schools program of the California Energy Extension Service)	January 1982
January 1982 issue of Professional News Newsletter (published by the Vocational Industrial Clubs of America)	January 1982